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(54) **PIVOT BAR FOR WINDOW SASH**

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E06B 3/50	(2006.01)
E05D 15/22	(2006.01)
E05C 7/00	(2006.01)
E05D 13/00	(2006.01)

(52) **U.S. Cl.**

CPC ***E05C 1/10*** (2013.01); ***E06B 3/5063*** (2013.01); *E05C 2007/007* (2013.01); *E05D 13/1207* (2013.01); *E05D 15/22* (2013.01)

(58) **Field of Classification Search**

CPC ... E06B 3/5063; E05D 13/12; E05D 13/1207; E05D 13/1276; E05D 15/22

See application file for complete search history.

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(57) **ABSTRACT**

A pivot bar for a tiltable window sash may include an elongated body, an anti-rotation feature and a retaining finger. The elongated body has first and second opposing ends and first and second opposing surfaces extending between the first and second ends. The elongated body also has a first longitudinal axis extending through the first and second ends. The first end may be configured to be received in a window balance assembly. The retaining finger may extend from the second surface and may be configured to engage the tiltable window sash.

11 Claims, 7 Drawing Sheets

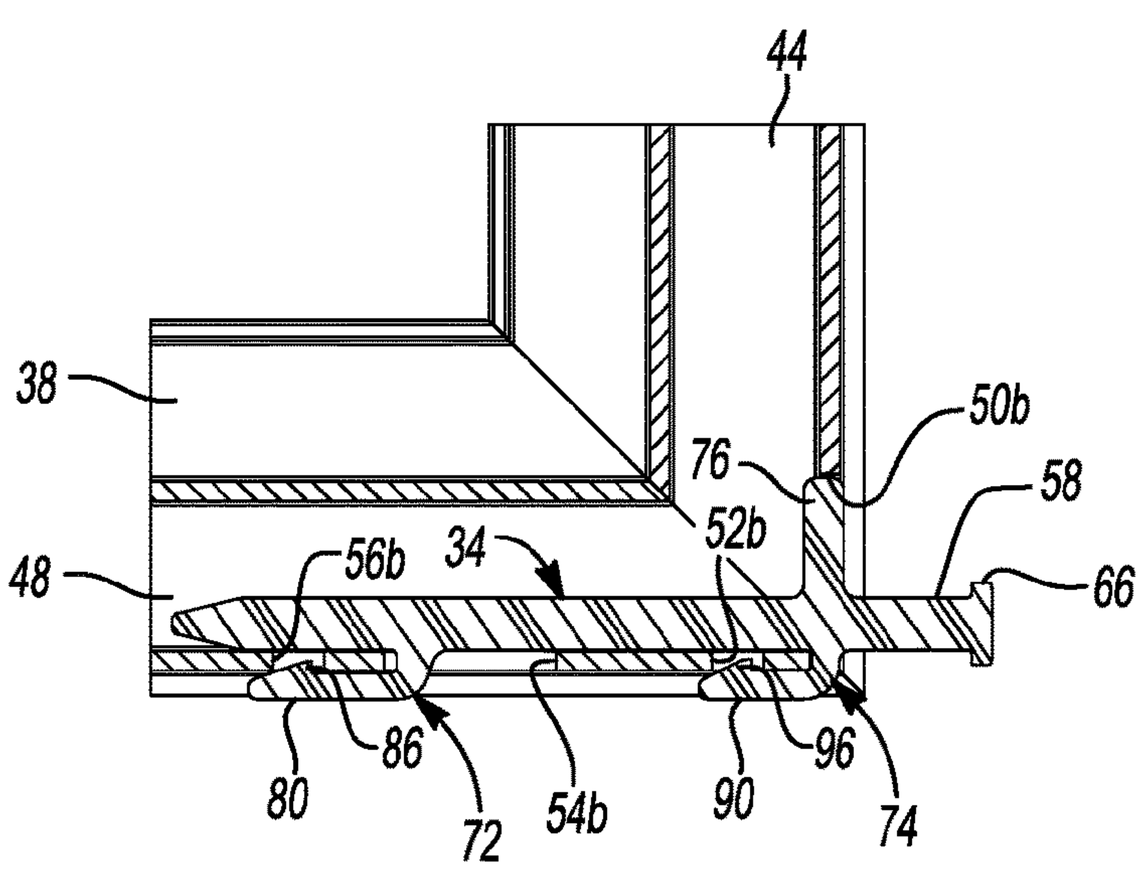

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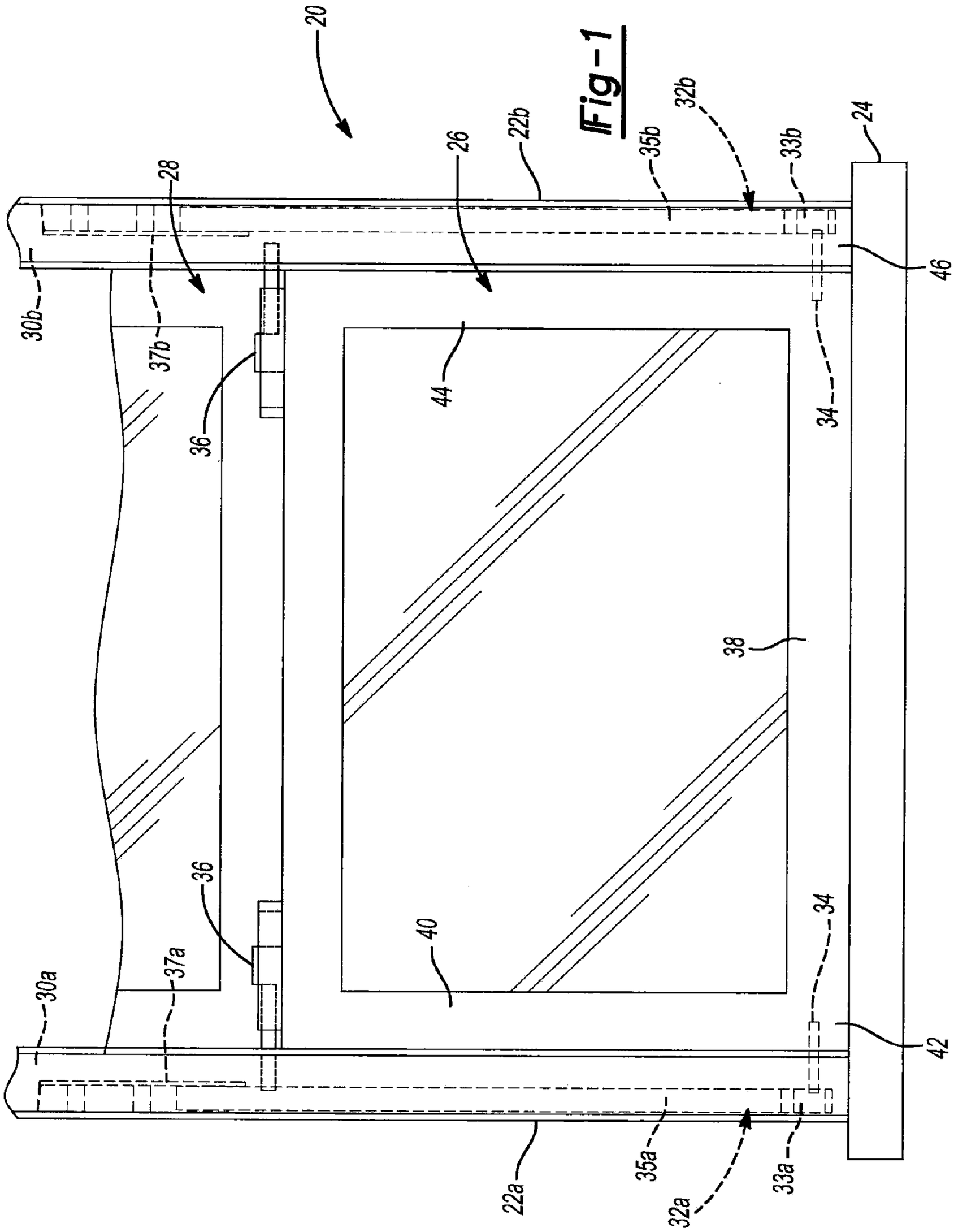
Fig-1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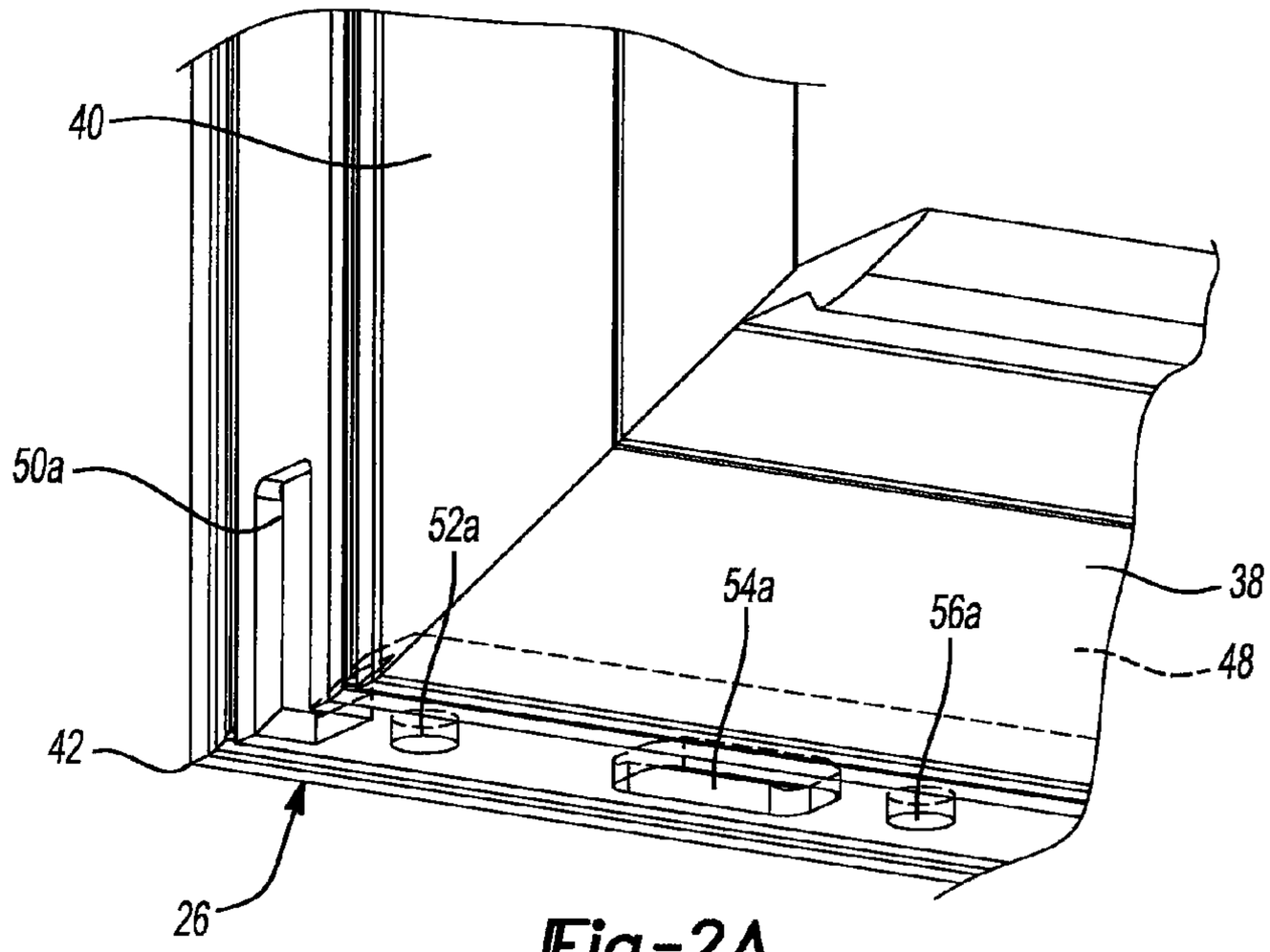

Fig-2A

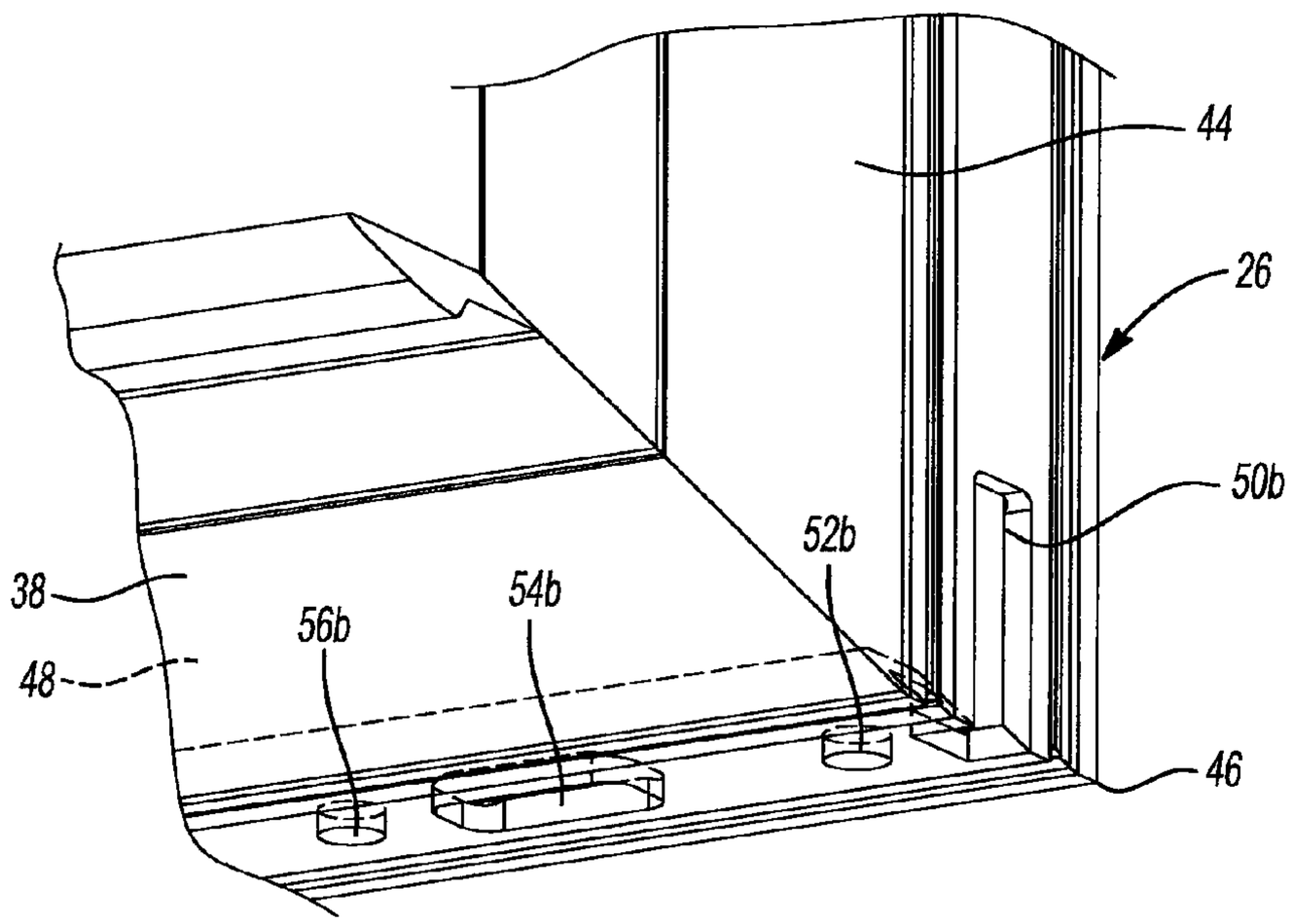

Fig-2B

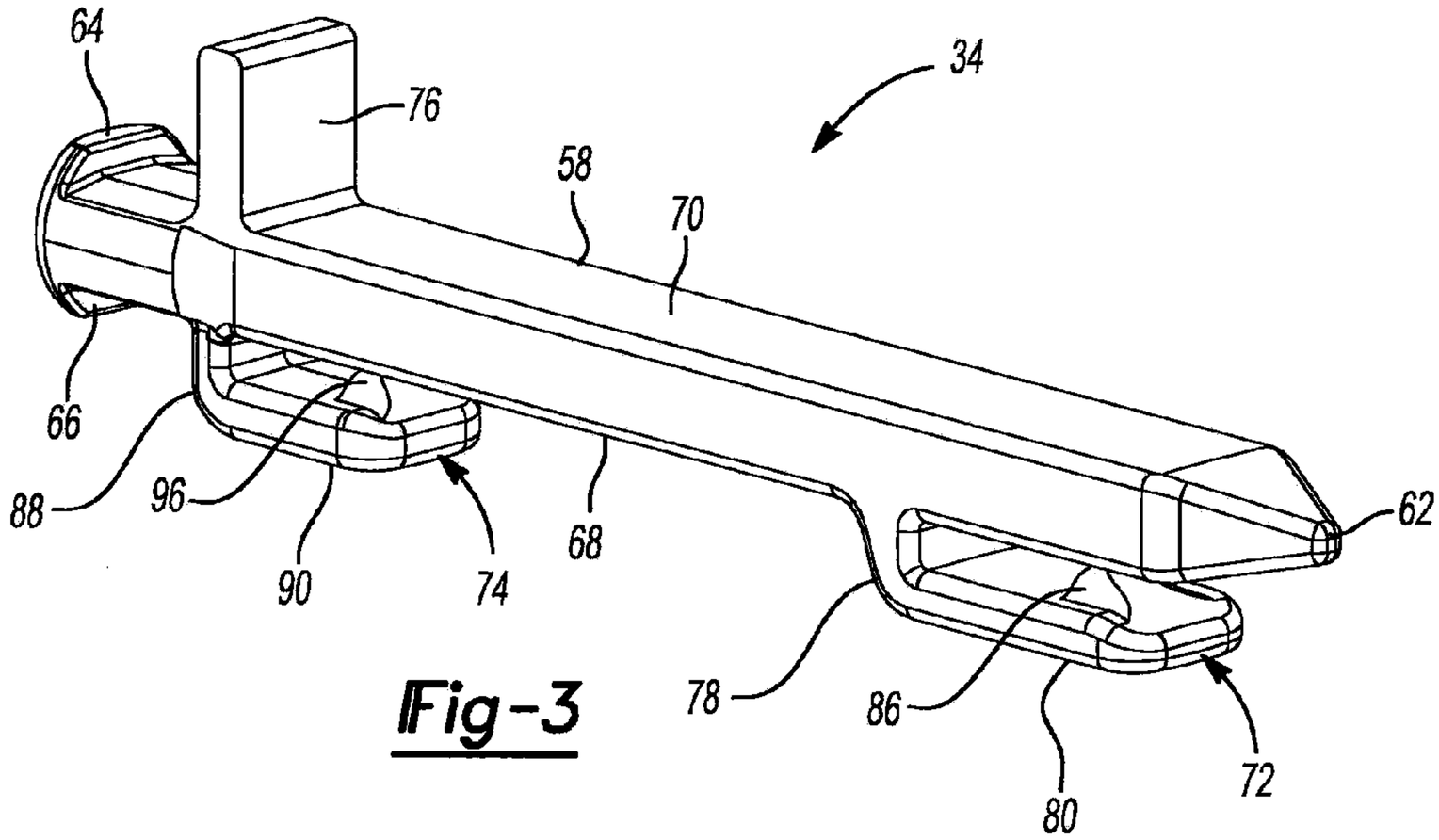
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Fig-3

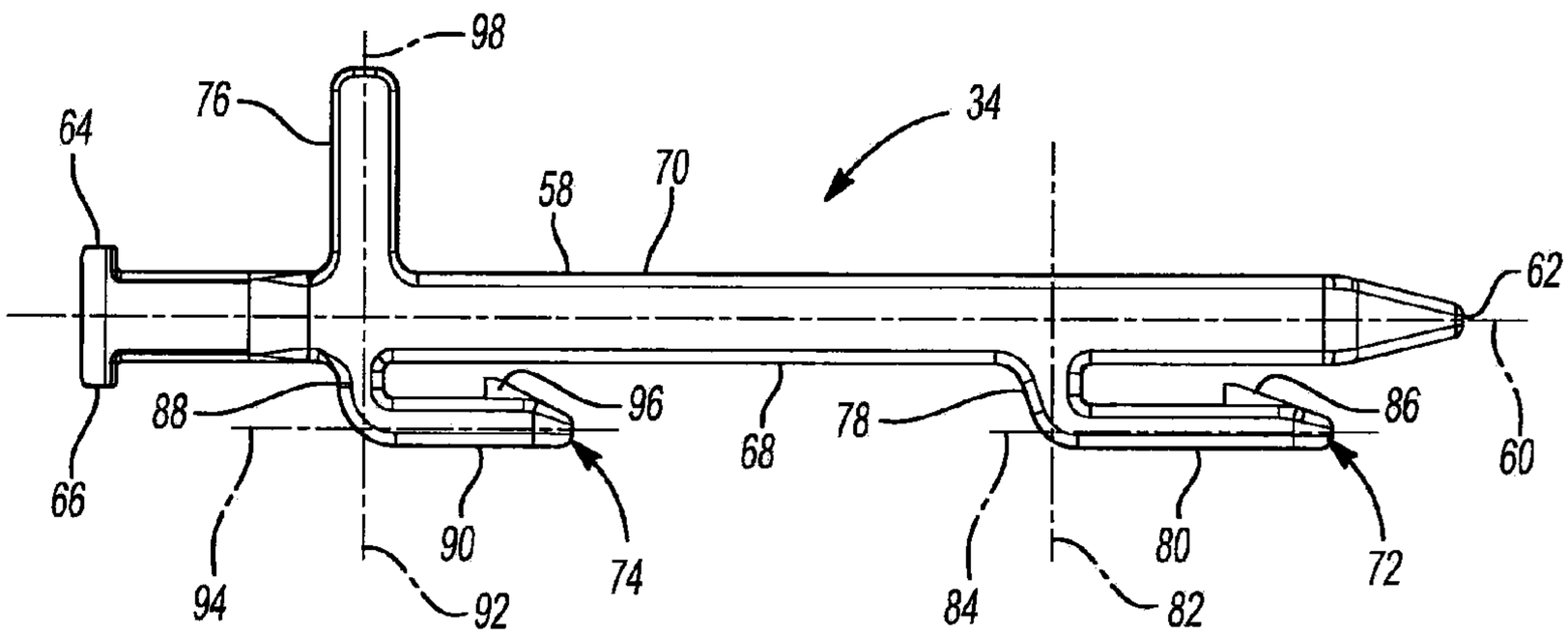
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Fig-4

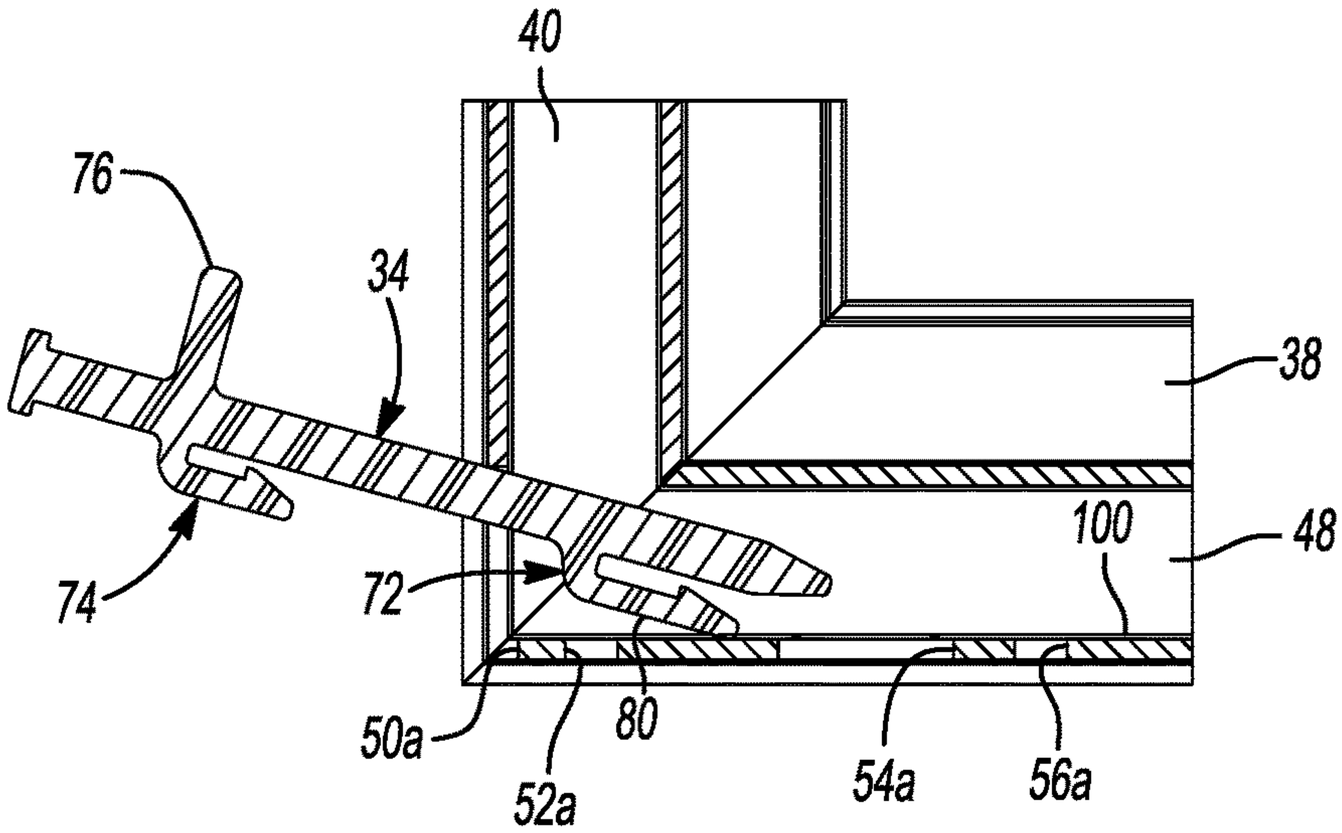

Fig-5A

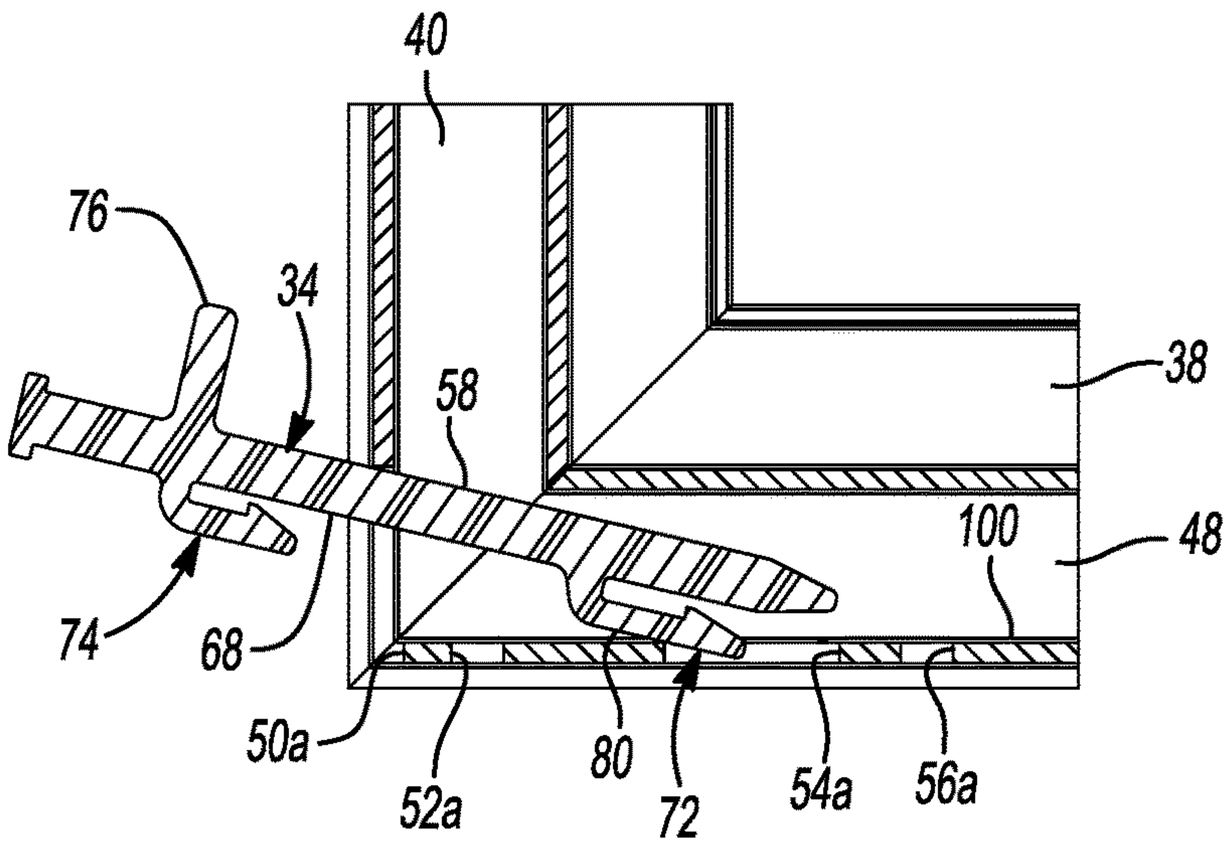

Fig-5B

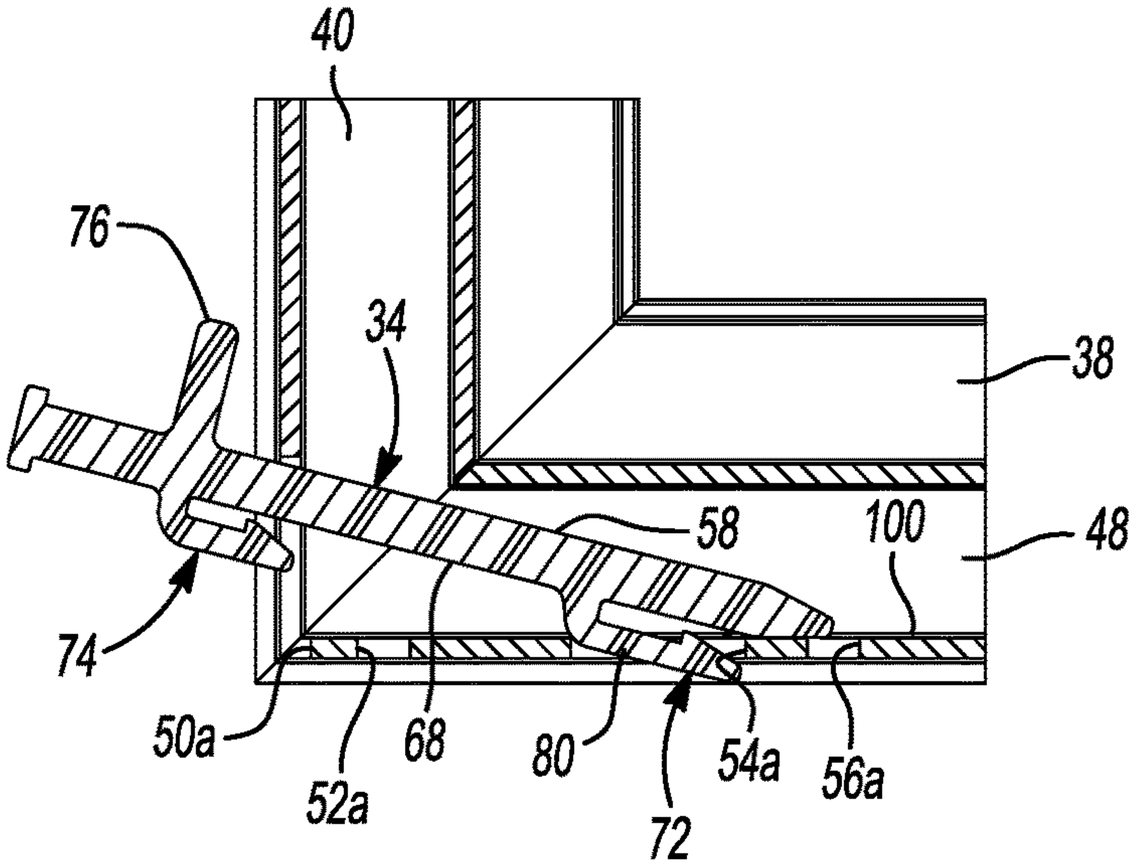

Fig-5C

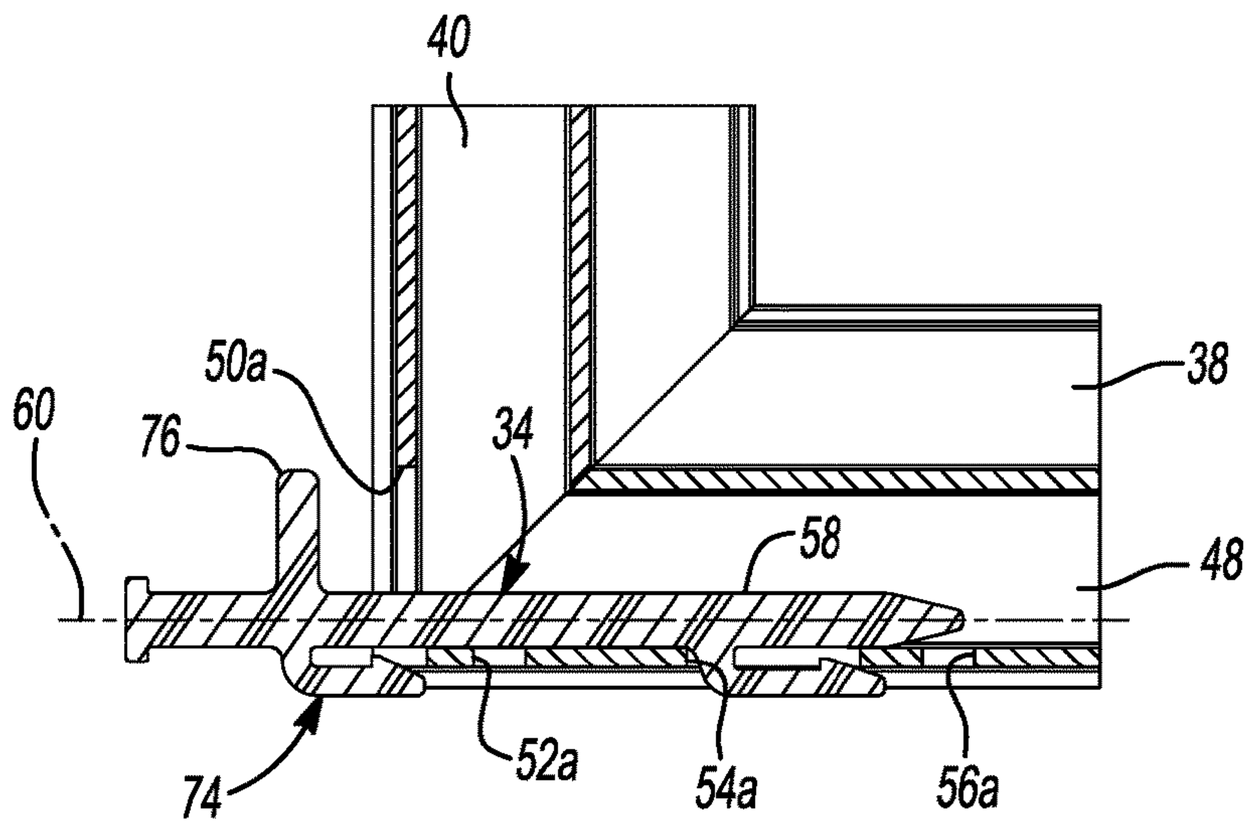

Fig-5D

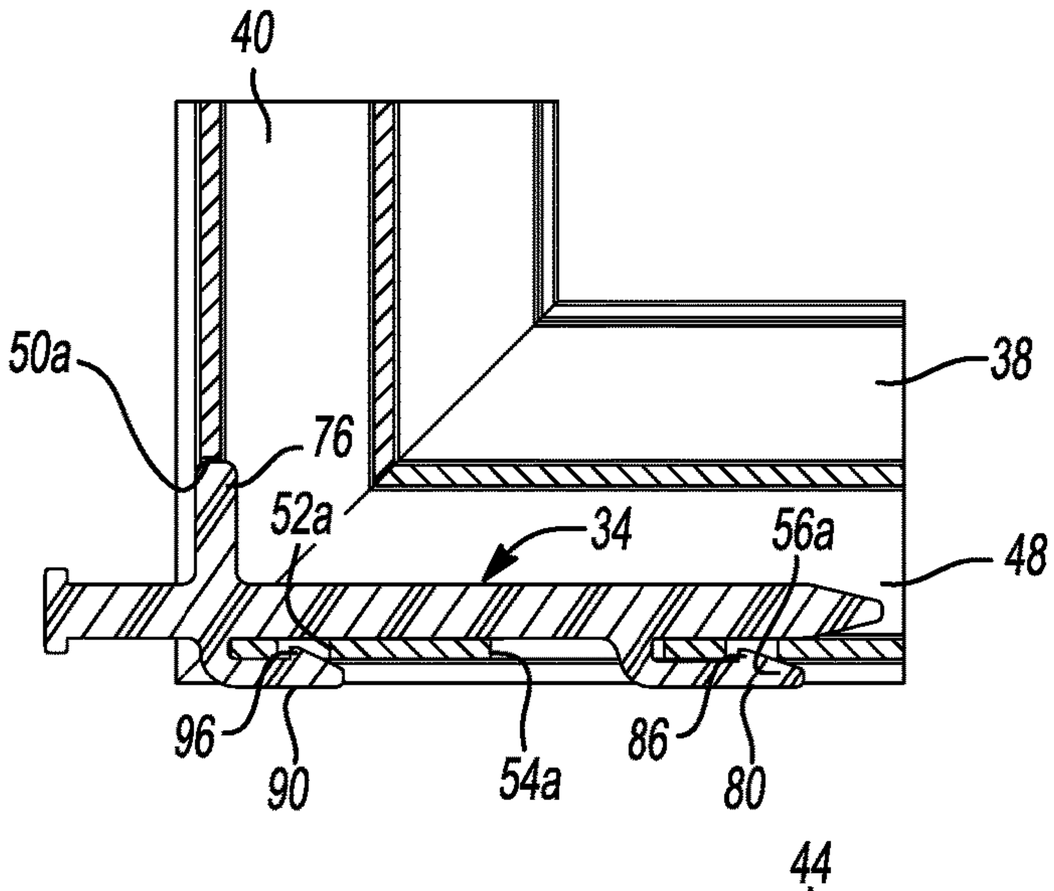

Fig-5E

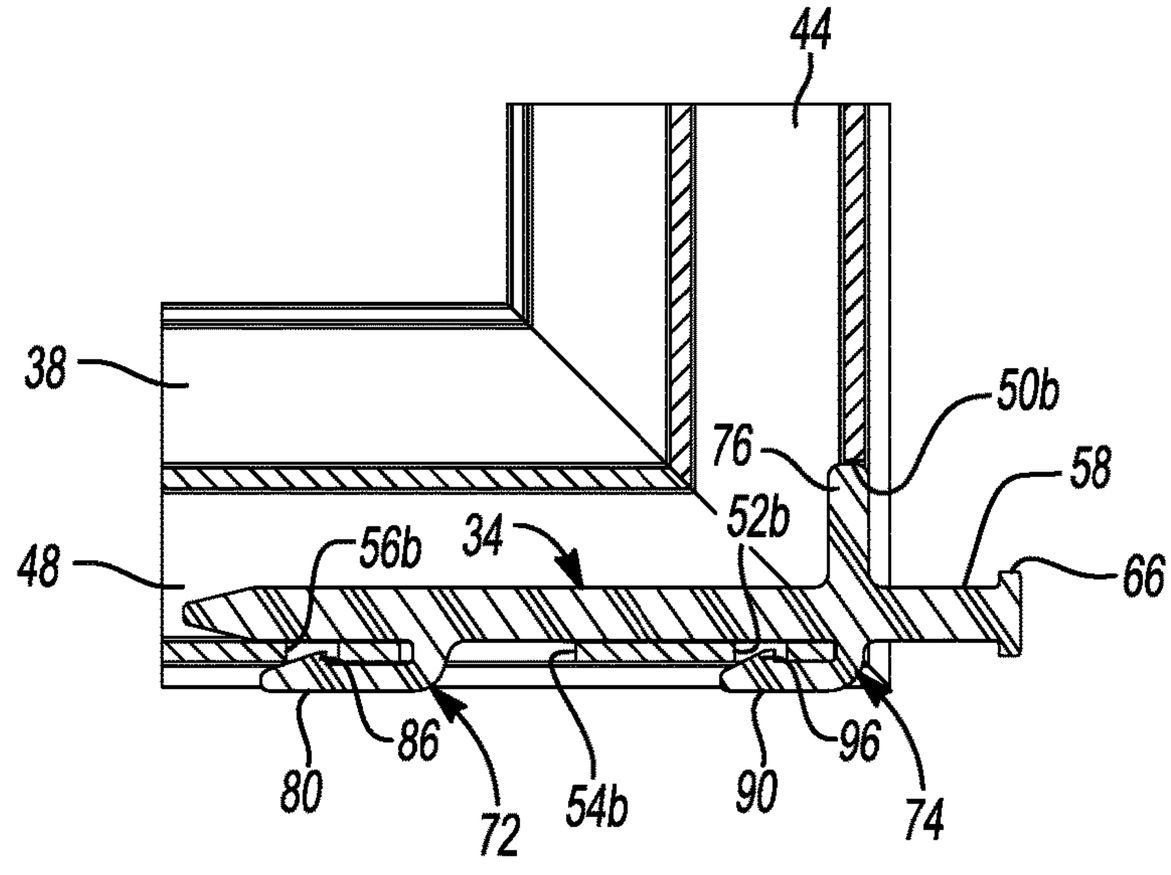

Fig-6

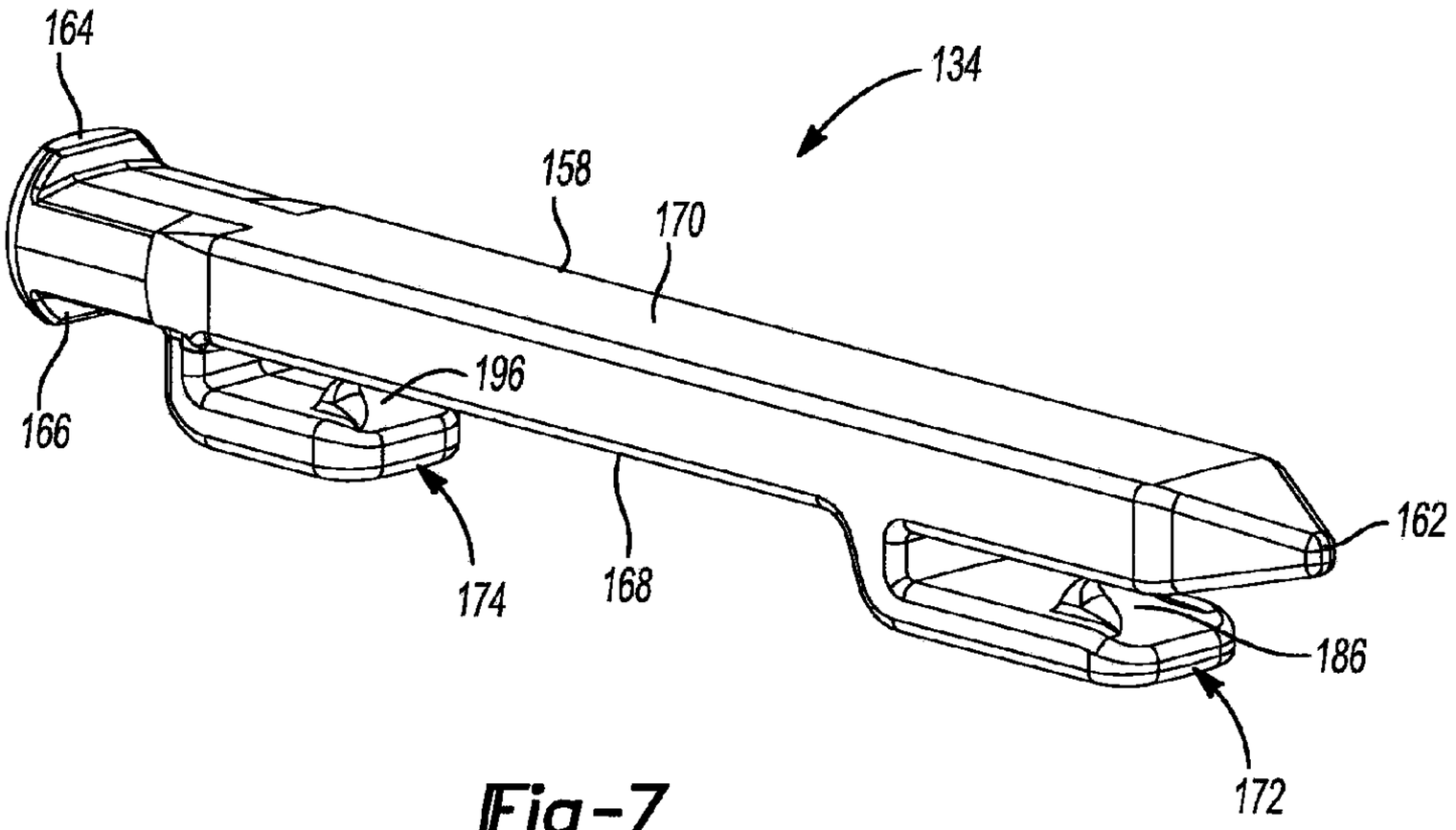
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Fig-7

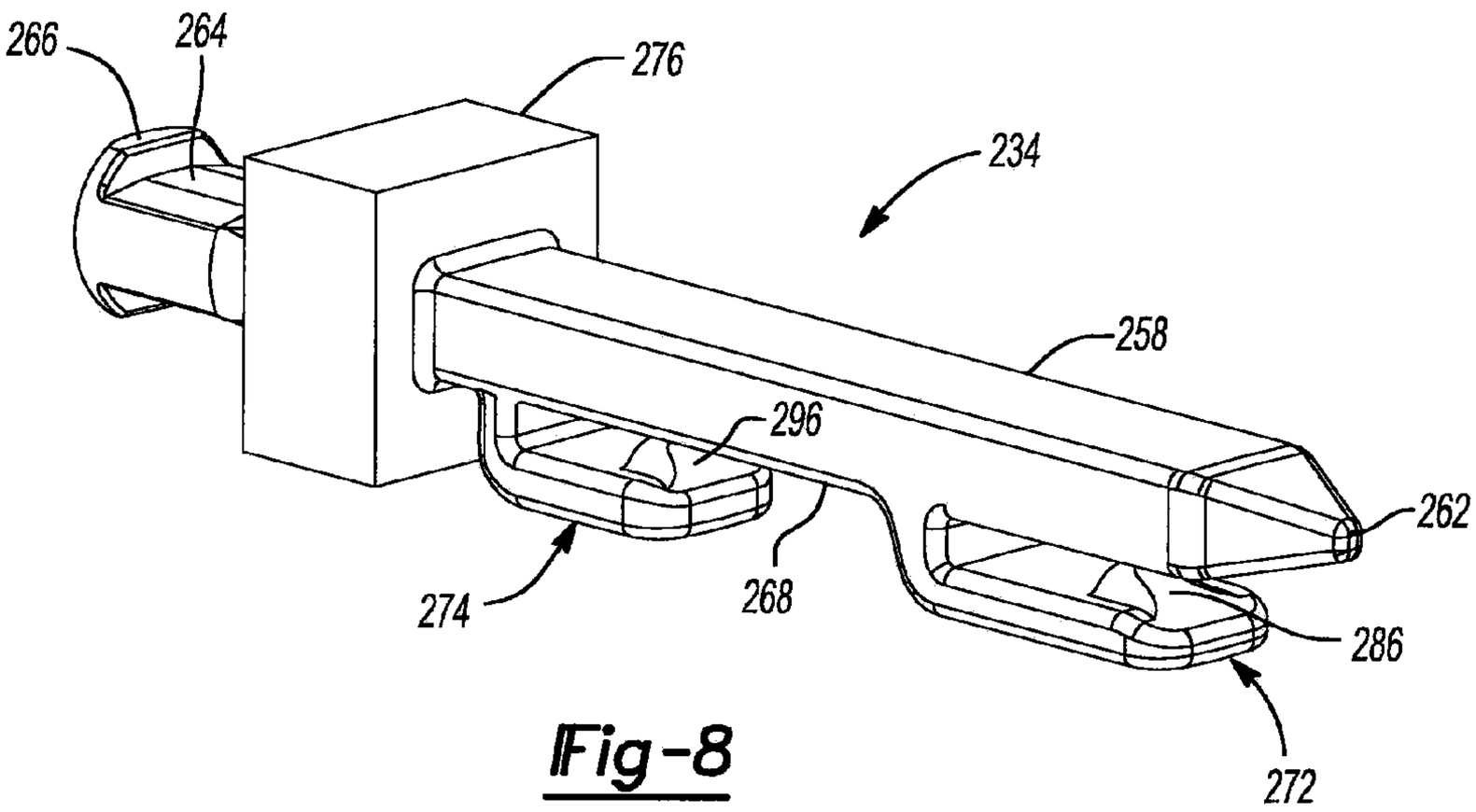
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Fig-8

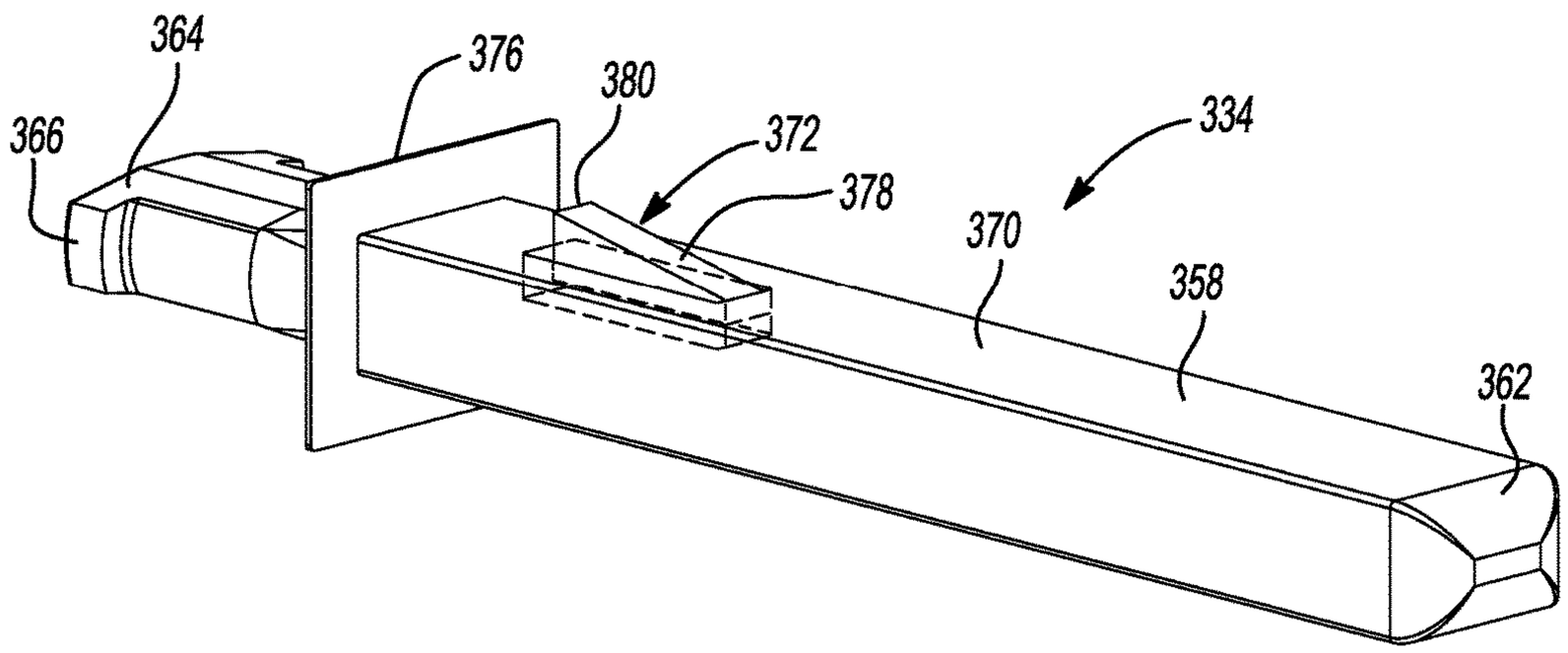
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Fig-9

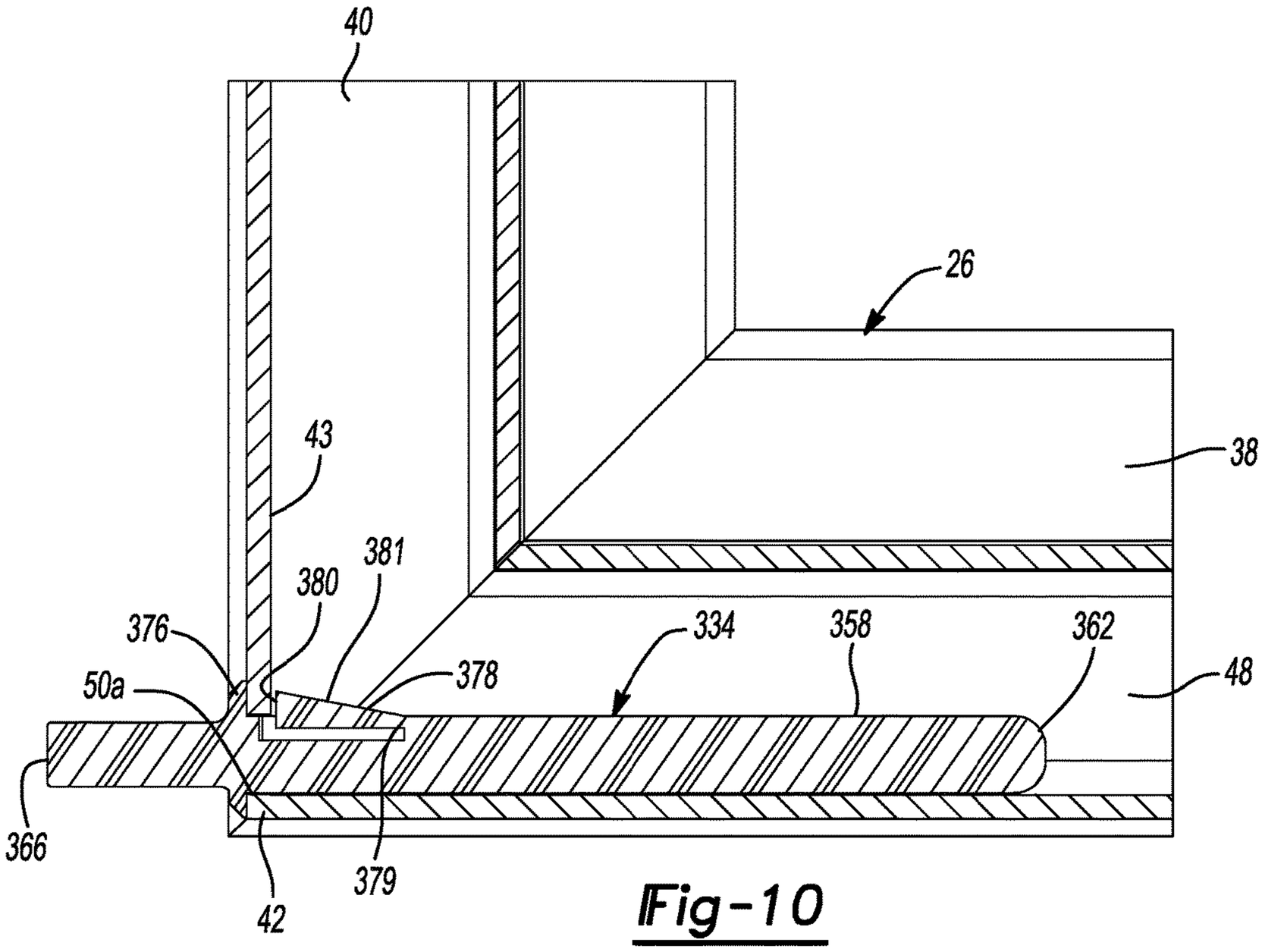
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Fig-10

PIVOT BAR FOR WINDOW SASH

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 62/072,598, filed on Oct. 30, 2014. The entire disclosure of the above application is incorporated herein by reference.

FIELD

The present disclosure relates to hardware for a window sash, and more particularly, to a pivot bar for a tiltable window sash.

BACKGROUND

This section provides background information related to the present disclosure and is not necessarily prior art.

Modern window assemblies in residential, commercial and industrial buildings may include one or more window sashes that are vertically moveable relative to a window jamb. The window sash(es) may include pivot bars, allowing the window sash(es) to also tilt relative to a window jamb.

SUMMARY

This section provides a general summary of the disclosure, and is not a comprehensive disclosure of its full scope or all of its features.

In one form, the present disclosure provides a pivot bar for a tiltable window sash that may include an elongated body, an anti-rotation feature and a retaining finger. The elongated body has first and second opposing ends and first and second opposing surfaces extending between the first and second ends. The elongated body also has a first longitudinal axis extending through the first and second ends. The first end may be configured to be received in a window balance assembly. The retaining finger may extend from the second surface and may be configured to engage the tiltable window sash.

In some embodiments, the retaining finger is resiliently flexible relative to the elongated body and includes a fixed end and a free end.

In some embodiments, the retaining finger includes a first leg and a second leg, the first leg extends laterally outward from the second surface of the elongated body and the second leg extends from a distal end of the first leg.

In some embodiments, a free end of the second leg includes a retaining prong extending toward the elongated body.

In some embodiments, the second leg includes a second longitudinal axis that is substantially parallel to the first longitudinal axis.

In some embodiments, the first leg includes a third longitudinal axis that is substantially perpendicular to the first and second longitudinal axes.

In some embodiments, a fourth longitudinal axis of the anti-rotation feature and the third longitudinal axis of the first leg of the retaining finger are collinear.

In some embodiments, a fourth longitudinal axis of the anti-rotation feature is parallel to the third longitudinal axis of the first leg of the retaining finger.

In some embodiments, the first leg includes a first length extending along the third longitudinal axis and the second leg includes a second length extending along the second longitudinal axis, the first length is different than the second length.

In some embodiments, the anti-rotation feature includes a second longitudinal axis that is perpendicular to the first longitudinal axis of the elongated body.

In some embodiments, the pivot bar further comprises a second retaining finger extending from the second surface of the elongated body and is configured to engage the tiltable window sash.

In some embodiments, the second retaining finger includes a third leg and a fourth leg. The third leg extends laterally outward from the second surface of the elongated body and the fourth leg extends from a distal end of the third leg. The fourth leg includes a length that is different than the second leg and the third leg.

In yet another form, the present disclosure provides a window assembly that may include a window sash and a pivot bar. The window sash includes a vertical portion connected to a horizontal portion. The vertical portion includes a first aperture. The pivot bar includes an elongated body having first and second opposing surfaces and first and second opposing ends. The pivot bar may include a first retaining member extending from the second surface and received through the first aperture of the vertical portion. The first retaining member attaches the pivot bar to the window sash such that the first end extends laterally outward from the vertical portion of the window sash.

In some embodiments, the window assembly further comprises a window balance assembly engaging the first end of the pivot bar and supporting the window sash for rotation about an axis defined by the pivot bar.

In some embodiments, the horizontal portion includes a second aperture into which a tip of the first retaining member is received and a third aperture through which a portion of the elongated body is received.

In some embodiments, the horizontal portion includes a fourth aperture, and the pivot bar includes a second retaining member extending from the second surface. The second retaining member includes a second barb received in the fourth aperture.

In some embodiments, the first and second retaining members are resiliently flexible relative to the elongated body and each include a fixed end and a free end, the first and second barbs are disposed on the free ends of the first and second retaining members.

In some embodiments, the pivot bar includes a tab extending from the first surface and engaging the vertical portion of the window sash.

In some embodiments, the elongated body includes an anti-rotation feature engaging the vertical portion of the window sash.

In some embodiments, the tab extends from the first surface of the elongated body along a first longitudinal axis, the first retaining member includes a first leg extending from the second surface of the elongated body along a second longitudinal axis, and the second retaining member includes a second leg extending from the second surface of the elongated body along a third longitudinal axis, the first longitudinal axis and one of the second longitudinal axis and the third longitudinal axis are collinear.

In some embodiments, the anti-rotation feature extends from the first surface of the elongated body along a first longitudinal axis; the first retaining member includes a first leg extending from the second surface of the elongated body along a second longitudinal axis. The second retaining member includes a second leg extending from the second

surface of the elongated body along a third longitudinal axis. The first longitudinal axis and one of the second longitudinal axis and the third longitudinal axis are coplanar.

In some embodiments, the window sash further includes a second vertical portion connected to the horizontal portion, the horizontal portion further includes fifth and sixth apertures, the window assembly further includes a second pivot bar including a third retaining member received through the fifth aperture of the window sash, the third retaining member includes a third barb received in the sixth aperture of the window sash securely attaching the second pivot bar to the window sash.

In some embodiments, the second pivot bar includes a second tab and a fourth retaining member, the second tab engaging the second vertical portion of the window sash, the fourth retaining member received through a seventh aperture of the window sash, the fourth retaining member including a fourth barb received in an eighth aperture of the window sash.

In yet another form, the present disclosure provides a window assembly comprising a window sash a first pivot bar and a second pivot bar. The window sash includes first and second opposing vertical portions extending from respective first and second opposing ends of a horizontal portion. The first vertical portion has a first aperture and the horizontal portion has second, third, and fourth apertures. The second vertical portion has a fifth aperture. The horizontal portion further has sixth, seventh, and eighth apertures. The first pivot bar is attached to the window sash and extends laterally outward from the first aperture in a first direction. The first pivot bar includes a first elongated body, first and second retaining members extending from the first elongated body and a first projection extending from the first elongated body. The first retaining member includes a first barb received in the second aperture of the horizontal portion of the window sash. The second retaining member is received in the third aperture of the horizontal portion and includes a second barb received in the fourth aperture of the horizontal portion. The first projection abuts the first vertical portion of the window frame. The second pivot bar is attached to the window sash and extends laterally outward from the fifth aperture in a second direction opposite the first direction. The second pivot bar includes a second elongated body, third and fourth retaining members extending from the second elongated body and a second projection extending from the second elongated body. The third retaining member includes a third barb received in the sixth aperture of the horizontal portion. The fourth retaining member is received through the seventh aperture of the horizontal portion and includes a fourth barb received in the eighth aperture of the horizontal portion. The second projection abuts the second vertical portion of the window frame.

In some embodiments, the first retaining member includes a first leg and a second leg. The first leg extends laterally outward from a first surface of the first elongated body and the second leg extends from a distal end of the first leg. The second retaining member includes a third leg and a fourth leg. The third leg extends laterally outward from the first surface of the first elongated body and the fourth leg extends from a distal end of the third leg. The second leg and the fourth leg extend along a common axis, and the projection extends laterally outward from a second surface of the first elongated body.

In some embodiments, the window assembly further comprises first and second opposing window jambs. The first window jamb has a first jamb channel including a first window balance assembly. The first elongated body of the first pivot bar has a first end configured to engage the first window balance assembly. The second window jamb has a second jamb channel including a second window balance assembly. The second elongated body of the second pivot bar has a second end configured to engage the second window balance assembly.

In yet another form, the present disclosure provides a window assembly comprising a window sash and a first pivot bar. The window sash includes a first vertical portion and a horizontal portion. The first vertical portion defines a first aperture. The first pivot bar has an elongate body extending between opposing first and second ends and includes a first projection extending from the elongated body. The first end of the pivot bar is configured to be received in the first aperture such that the first projection engages at least a portion of the first vertical portion and the second end extends at least partially laterally outward from the first vertical portion.

In some embodiments, the first pivot bar further includes a first retaining prong configured to engage an inner surface of the vertical portion.

In some embodiments, the first pivot bar further includes a first retaining prong configured to engage a second aperture defined in the horizontal portion.

In some embodiments, the first pivot bar includes a second retaining prong configured to engage a third aperture defined in the horizontal portion.

In some embodiments, the window sash further includes a second vertical portion defining a fourth aperture and a second pivot bar including a second projection. A third end of the second pivot bar and the second projection of the second pivot bar are configured to be received in the fourth aperture of the second vertical portion such that the second projection engages at least a portion of the second vertical portion and a fourth end of the second pivot bar extends at least partially laterally outward from the second vertical portion.

In some embodiments, the second pivot bar includes a third retaining prong and a fourth retaining prong. The third retaining prong is configured to engage a fifth aperture defined in the horizontal portion. The fourth retaining prong is configured to engage a sixth aperture defined in the horizontal portion when the third retaining prong engages the sixth aperture.

Further areas of applicability will become apparent from the description provided herein. The description and specific examples in this summary are intended for purposes of illustration only and are not intended to limit the scope of the present disclosure.

DRAWINGS

The drawings described herein are for illustrative purposes only of selected embodiments and not all possible implementations, and are not intended to limit the scope of the present disclosure.

FIG. **1** is a partial front view of a window assembly including a lower sash and a pair of pivot bars according to the principles of the present disclosure;

FIGS. **2**A and **2**B are partial perspective views of the lower sash of FIG. **1**;

FIG. **3** is a perspective view of one of the pivot bars of FIG. **1** according to the principles of the present disclosure;

FIG. **4**. is a front view of one of the pivot bars of FIG. **1** according to the principles of the present disclosure;

FIGS. **5**A-**5**E are cross-sectional views showing a method of attaching one of the pivot bars to the lower sash of FIG. **2**A according to the principles of the present disclosure;

FIG. **6** is a cross-sectional view showing another one of the pivot bars attached to the lower sash of FIG. **2**B according to the principles of the present disclosure;

FIG. **7** is a perspective view of another pivot bar according to the principles of the present disclosure;

FIG. **8** is a perspective view of another pivot bar according to the principles of the present disclosure;

FIG. **9** is a perspective view of another pivot bar according to the principles of the present disclosure; and

FIG. **10** is a cross-sectional view showing the pivot bar of FIG. **9** attached to the lower sash of FIG. **2**A according to the principles of the present disclosure.

Corresponding reference numerals indicate corresponding parts throughout the several views of the drawings.

DETAILED DESCRIPTION

Example embodiments will now be described more fully with reference to the accompanying drawings.

Example embodiments are provided so that this disclosure will be thorough, and will fully convey the scope to those who are skilled in the art. Numerous specific details are set forth such as examples of specific components, devices, and methods, to provide a thorough understanding of embodiments of the present disclosure. It will be apparent to those skilled in the art that specific details need not be employed, that example embodiments may be embodied in many different forms and that neither should be construed to limit the scope of the disclosure. In some example embodiments, well-known processes, well-known device structures, and well-known technologies are not described in detail.

The terminology used herein is for the purpose of describing particular example embodiments only and is not intended to be limiting. As used herein, the singular forms "a," "an," and "the" may be intended to include the plural forms as well, unless the context clearly indicates otherwise. The terms "comprises," "comprising," "including," and "having," are inclusive and therefore specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. The method steps, processes, and operations described herein are not to be construed as necessarily requiring their performance in the particular order discussed or illustrated, unless specifically identified as an order of performance. It is also to be understood that additional or alternative steps may be employed.

When an element or layer is referred to as being "on," "engaged to," "connected to," or "coupled to" another element or layer, it may be directly on, engaged, connected or coupled to the other element or layer, or intervening elements or layers may be present. In contrast, when an element is referred to as being "directly on," "directly engaged to," "directly connected to," or "directly coupled to" another element or layer, there may be no intervening elements or layers present. Other words used to describe the relationship between elements should be interpreted in a like fashion (e.g., "between" versus "directly between," "adjacent" versus "directly adjacent," etc.). As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

Although the terms first, second, third, etc. may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms may be only used to distinguish one element, component, region, layer or section from another region, layer or section. Terms such as "first," "second," and other numerical terms when used herein do not imply a sequence or order unless clearly indicated by the context. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of the example embodiments.

Spatially relative terms, such as "inner," "outer," "beneath," "below," "lower," "above," "upper," and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. Spatially relative terms may be intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "below" or "beneath" other elements or features would then be oriented "above" the other elements or features. Thus, the example term "below" can encompass both an orientation of above and below. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

With reference to FIG. **1**, a window assembly **20** is provided that may include a pair of opposing window jambs **22***a*, **22***b*, a window sill **24**, a header (not shown), a lower sash **26** and an upper sash **28**. Each window jamb **22***a*, **22***b* may include a jamb channel **30***a*, **30***b* having at least one window balance assembly **32***a*, **32***b*, respectively. Each window balance assembly **32***a*, **32***b* may include a corresponding carrier (or shoe) **33***a*, **33***b*, a corresponding spring **35***a*, **35***b* and a corresponding bracket **37***a*, **37***b*. Each bracket **37***a*, **37***b* may be fixedly attached to a corresponding window jamb **22***a*, **22***b*, and each spring **35***a*, **35***b* may extend between a corresponding bracket **37***a*, **37***b* and a corresponding carrier **33***a*, **33***b* to bias the carriers **33***a*, **33***b* upward. It will be appreciated that the window balance assemblies **32***a*, **32***b* can be configured in any suitable manner. For example, the structure and function of the window balance assemblies **32***a*, **32***b* could be similar or identical to that of any of the window balance assemblies disclosed in Assignee's commonly owned U.S. Pat. No. 8,561,260, U.S. Patent Application Publication No. 2014/0000172, and U.S. Pat. No. 6,041,476, the disclosures of which are hereby incorporated by reference.

The lower sash **26** may include a pair of pivot bars **34** and a pair of tilt latch mechanisms **36**. Each pivot bar **34** may be securely attached to a lower portion of the lower sash **26** and may extend horizontally outward in an opposing direction into a corresponding jamb channel **30***a*, **30***b* and selectively engage a corresponding carrier **33***a*, **33***b*. When engaged, the window balance assemblies **32***a*, **32***b* may assist a user in raising and lowering the lower sash **26** between an open and closed position, respectively and to maintain the lower sash **26** at a desired vertical position relative to the window jambs **22***a*, **22***b*, for example.

Each tilt latch mechanism **36** may be securely attached to an upper portion of the lower sash **26** and may extend horizontally outward in an opposing direction and selectively engage a corresponding window jamb **22***a*, **22***b*. The tilt latch mechanisms **36** may be selectively actuated (i.e., retracted from the window jambs **22***a*, **22***b*) to allow the lower sash **26** to pivot about the pivot bars **34** relative to the window jambs **22***a*, **22***b* to facilitate cleaning of an exterior

side of the window assembly **20** and to allow separation of the lower sash **26** from the window assembly **20**, for example.

In the particular embodiment illustrated in FIG. **1**, the upper sash **28** is fixed relative to the window jambs **22***a*, **22***b* (i.e., a single hung window assembly); however, in some embodiments, the upper sash **28** may also be movable relative to the window jambs **22***a*, **22***b* (i.e., a double hung window assembly). It will be appreciated that in a double hung window assembly, the upper sash **28** may also be connected to two or more window balance assemblies to assist the user in raising and lowering the upper sash **28** between an open and closed position, respectively and to maintain the upper sash **28** at a desired vertical position relative to the window jambs **22***a*, **22***b*, for example. In such a window assembly, the upper sash **28** may also include tilt latch mechanisms and pivot bars to allow the upper sash **28** to function in the manner described above.

With additional reference to FIGS. **2**A and **2**B, the lower sash **26** may comprise a frame and include a lower horizontal portion or rail **38** and opposing first and second vertical portions or stiles **40**, **44** connected to the lower horizontal portion **38** at respective first and second corners **42**, **46**. A channel **48** may extend through at least a portion of the lower horizontal portion **38** and at least a portion of each of the first and second vertical portions **40**, **44**. At the first corner **42** (FIG. **2**A), an aperture **50***a* in communication with the channel **48** may extend through the lower horizontal portion **38** and the first vertical portion **40**. At the second corner **46** (FIG. **2**B), a similar aperture **50***b* also in communication with the channel **48** may extend through the lower horizontal portion **38** and the second vertical portion **44**. Near the first corner **42**, a first set of second **52***a*, third **54***a* and fourth apertures **56***a* in communication with the channel **48** may extend through the lower horizontal portion **38** (FIG. **2**A), and near the second corner **46**, a second set of similar second **52***b*, third **54***b* and fourth apertures **56***b* in communication with the channel **48** may also extend through the lower horizontal portion **38** (FIG. **2**B).

With reference to FIGS. **3** and **4**, the pivot bars **34** may each include an elongated body **58** molded and/or machined from a polymeric or metallic material, for example. The elongated body **58** may have a rectangular shape extending along a first longitudinal axis **60** and may include first and second opposing ends **62**, **64**. The first end **62** may be tapered, and the second end **64** may include a flange **66** for selectively engaging one of the carriers **33***a*, **33***b* of a corresponding window balance assembly **32***a*, **32***b*. First and second retaining members **72**, **74** may extend from a lower surface **68** of the elongated body **58**, and an anti-rotation feature **76** may extend from an opposing upper surface **70**. As will be described further below, the first and second retaining members **72**, **74** and the anti-rotation feature **76** may cooperate to securely attach the pivot bar **34** to the lower sash **26**.

The first retaining member **72** may be integrally formed with the elongated body **58** or may be attached thereto. The first retaining member **72** may include a resiliently flexible first leg **78** extending downwardly from the lower surface **68** of the elongated body **58** along a second longitudinal axis **82**, and a resiliently flexible second leg **80** extending horizontally from a distal end of the first leg **78** along a third longitudinal axis **84**. The second longitudinal axis **82** of the first leg **78** may be substantially perpendicular to the first longitudinal axis **60** of the elongated body **58**, and the third longitudinal axis **84** of the second leg **80** may be substantially parallel to the first longitudinal axis **60** of the elongated body **58** A first retaining prong or barb **86** may be disposed near a distal end of the second leg **80** and may extend upwardly towards the lower surface **68** of the elongated body **58**. As shown, the first leg **78** is generally shorter in length than the second leg **80**; however in other configurations, the first leg **78** may be the same length or longer than the second leg **80**.

The second retaining member **74** may also be integrally formed with the elongated body **58** or may be rigidly attached thereto. The second retaining member **74** may include a resiliently flexible third leg **88** extending downwardly from the lower surface **68** of the elongated body **58** along a fourth longitudinal axis **92**. A resiliently flexible fourth leg **90** extending horizontally from a distal end of the third leg **88** along a fifth longitudinal axis **94**. A second retaining prong or barb **96** may be disposed near a distal end of the fourth leg **90** and may extend upwardly towards the lower surface **68** of the elongated body **58**. As shown, the third leg **88** is generally shorter in length than the fourth leg **90**; however, in some configurations, the third leg **88** may be the same length or longer in length than the fourth leg **90**. Also, the third leg **88** may be the same length as the first leg **78** of the first retaining member **72**, or the third leg **88** may be shorter or longer in length than the first leg **78**. Similarly, the fourth leg **90** may be the same length, shorter, or longer than the second leg **80** of the first retaining member **72**. The fourth longitudinal axis **92** of the third leg **88** may be substantially perpendicular to the first longitudinal axis **60** of the elongated body **58**, and the fifth longitudinal axis **94** of the fourth leg **90** may be substantially parallel to the first longitudinal axis **60** of the elongated body **58**. The fifth longitudinal axis **94** of the fourth leg **90** may also be collinear with the third longitudinal axis **84** of the second leg **80**.

The anti-rotation feature **76** may be a rectangular projection extending upwardly from the upper surface **70** of the elongated body **58** along a sixth longitudinal axis **98**. The anti-rotation feature **76** may be configured to engage the lower sash **26**, as will be described further below. Alternatively, the anti-rotation feature **76** may include other shapes and/or cross sections. The sixth longitudinal axis **98** of the anti-rotation feature **76** may be substantially perpendicular to the first longitudinal axis **60** of the elongated body **58**, the third longitudinal axis **84** of the second leg **80** and the fifth longitudinal axis **94** of the fourth leg **90**. The sixth longitudinal axis **98** of the anti-rotation feature **76** may also be substantially parallel to the second longitudinal axis **82** of the first leg **78** and the fourth longitudinal axis **92** of the third leg **88**, and may further be collinear with the fourth longitudinal axis **92** of the third leg **88**.

With reference to FIGS. **5**A-**5**E and **6**, a method of attaching the pivot bars **34** to the lower sash **26** will be described. The same description may also apply to attaching one or more pivot bars to an upper sash of a double hung window assembly.

At FIGS. **5**A-**5**C, one of the pivot bars **34** may be angularly inserted into the aperture **50***a* and into the channel **48** of the lower sash **26** until the second leg **80** of the first retaining member **72** is received through the third aperture **54***a* of the horizontal portion **38**. At FIG. **5**D, the pivot bar **34** may be tilted downwardly such that the first longitudinal axis **60** of the elongated body **58** is oriented generally parallel to the horizontal portion **38**. At FIG. **5**E, the pivot bar **34** may be horizontally inserted further into the channel **48** until the anti-rotation feature **76** engages the first vertical portion **40**, the first retaining barb **86** snaps into the fourth aperture **56***a*, and the second retaining barb **96** snaps into the

second aperture **52***a*. Alternatively, the pivot bar **34** may be horizontally inserted into the channel **48** until the anti-rotation feature **76** is partially received in the aperture **50***a* and the first and second retaining barbs **86**, **96** snap into the fourth and second apertures **56***a*, **52***a*, respectively. Accordingly, the pivot bar **34** can be securely attached to the lower sash **26** without requiring any fasteners or mounting hardware as may be required in other applications to securely attach a pivot bar to a lower sash. In this regard, the number of components required to construct a lower sash may be reduced. Additionally, by not requiring any fasteners or mounting hardware to securely attach a pivot bar to a lower sash, the time and cost required to assemble a lower sash may be reduced, as ancillary equipment required to install fasteners and/or mounting hardware is not required, for example. Further, the quality and consistency of attaching a pivot bar to a lower sash may be improved, as the need to calibrate and periodically verify screw torque settings is eliminated, for example.

As shown in FIG. **6**, the pivot bar **34** may be securely attached to the other side of the lower sash **26** in a similar manner described above. That is, the pivot bar **34** may be angularly, and subsequently horizontally, inserted into the aperture **50***b* and into the channel **48** of the lower sash **26** until the anti-rotation feature **76** engages the second vertical portion **44**, the first retaining barb **86** of the first retaining member **72** snaps into the fourth aperture **56***b* of the horizontal portion **38**, and the second retaining barb **96** of the second retaining member **74** snaps into the second aperture **52***b* of the horizontal portion **38**.

Once the pivot bars **34** are attached to the lower sash **26**, the lower sash **26** may be positioned between the opposing window jambs **22***a*, **22***b*, as shown in FIG. **1**, and the flange **66** of each pivot bar **34** may selectively engage the corresponding carrier **33***a*, **33***b* of a corresponding window balance assembly **32***a*, **32***b*. The tilt latch mechanisms **36** may then be selectively actuated (i.e., retracted from the window jambs **22***a*, **22***b*) to allow the lower sash **26** to pivot about the pivot bars **34** relative to the window jambs **22***a*, **22***b*. It will be appreciated that when each pivot bar **34** is securely attached to the lower sash **26**, and the anti-rotation feature **76** engages a respective first and second vertical portion **40**, **44** of the lower sash **26**, each anti-rotation feature **76** may act as a torque-arrestor to brace the pivot bar **34** against reaction forces generated from torque or twisting forces applied on the pivot bar **34** and/or on the retaining members **72**, **74** as the lower sash **26** pivots about the pivot bars **34** relative to the window jambs **22***a*, **22***b*.

The pivot bar(s) **34** may be removed from the lower sash **26** by generally following the previously described attachment method in reverse. In other words, with reference to FIGS. **5**E and **6**, with the lower sash **26** separated from the window jambs **22***a*, **22***b*, each of the second and fourth legs **80**, **90** of the retaining members **72**, **74** may be flexed downwardly and away from the horizontal portion **38** of the lower sash **26** until each of the retaining barbs **86**, **96** snap out of the corresponding and respective apertures **56***a*, **52***a* and **56***b*, **52***b* of the horizontal portion **38**. Each of the pivot bars **34** may then be removed from the channel **48** and from the respective apertures **50***a*, **50***b*.

With reference to FIG. **7**, another pivot bar **134** for use with the lower sash **26** of the window assembly **20** of FIG. **1** is shown. Like the pivot bar **34** described above, the pivot bar **134** may include an elongated body **158** having a rectangular shape molded and/or machined from a polymeric or metallic material, for example. The elongated body **158** may include a first tapering end **162** and an opposing second end **164**. The second end **164** may include a flange **166** configured to selectively engage the carrier **33***a*, **33***b* of a corresponding window balance assembly **32***a*, **32***b* of FIG. **1**.

The elongated body **158** may also include first and second retaining members **172**, **174** that may be similar to the first and second retaining members **72**, **74** described above. For example, each of the first and second retaining members **172**, **174** may extend downwardly from a lower surface **168** of the elongated body **158**. Each retaining member **172**, **174** may include a respective retaining prong or barb **186**, **196** configured to selectively snap into a corresponding aperture defined in the lower sash **26**. However, unlike the pivot bar **34**, the pivot bar **134** may lack an anti-rotation feature like the above-described anti-rotation feature **76** for example.

Because the method for attaching one or more pivot bars **134** to the lower sash **26** may be similar to the method for attaching one or more pivot bars **34** to the lower sash **26** described above (save for an anti-rotation feature engaging one of the vertical portions **40**, **44** of the lower sash **26**), and because the method for removing one or more pivot bars **134** from the lower sash **26** may be similar to the method for removing one or more pivot bars **34** from the lower sash **26** described above, neither will be described in detail herein.

With reference to FIG. **8**, another pivot bar **234** for use with the lower sash **26** of the window assembly **20** of FIG. **1** is shown. The pivot bar **234** may be generally similar to the pivot bar **34** described above, apart from any exceptions described herein and/or shown in the figures. The pivot bar **234** may include an elongated body **258** having a rectangular shape molded and/or machined from a polymeric or metallic material. The elongated body **258** may include a first tapered end **262** and an opposing second end **264**. The second end **264** may include a flange **266** configured to selectively engage the carrier **33***a*, **33***b* of a corresponding window balance assembly **32***a*, **32***b* of FIG. **1**. The elongated body **258** may also include first and second retaining members **272**, **274** that may be similar to the first and second retaining members **72**, **74** of the pivot bar **34**. For example, each of the first and second retaining members **272**, **274** may extend downwardly from a lower surface **268** of the elongated body **258**, and each retaining member **272**, **274** may include a respective retaining prong or barb **286**, **296** configured to selectively snap into a corresponding aperture defined in the lower sash **26**.

The elongated body **258** may further include a torque arrestor or anti-rotation feature **276** disposed between the second retaining member **274** and the flange **266**. The anti-rotation feature **276** may be configured to engage at least a portion of the lower sash **26**, such as one of the first and second vertical portions **40**, **44** for example. The anti-rotation feature **276** may act to brace the pivot bar **234** against reaction forces generated from torque or twisting forces applied onto the pivot bar **234** and/or the retaining members **272**, **274** as the lower sash **26** pivots about the pivot bars **234**. The anti-rotation feature **276** may have a rectangular-prism shape centered on longitudinal axis of the elongated body **258**. That is, the anti-rotation feature **276** may extend outward from the elongated body **258** in an upward direction, in a downward direction and in two opposing lateral directions. It should be understood that in some configurations, the anti-rotation feature **276** may include other shapes and/or cross sections configured to engage at least a portion of the lower sash **26** to brace the pivot bar **234** against reaction forces during use.

The method for attaching one or more of the pivot bars **234** to the lower sash **26** may be similar to the above-

described method for attaching one or more of the pivot bars **34** to the lower sash **26** and will therefore not be described again in detail. Also, the method for removing one or more of the pivot bars **234** from the lower sash **26** may be similar to the above-described method for removing one or more of the pivot bars **34** from the lower sash **26** described above and will therefore also not be described again in detail.

With reference to FIGS. **9** and **10**, another pivot bar **334** for use with the lower sash **26** of the window assembly **20** of FIG. **1** is shown. The pivot bar **334** may include an elongated body **358** having a substantially rectangular shape molded and/or machined from a polymeric or metallic material, for example. The elongated body **358** may have a first tapered end **362** and an opposing second end **364**. The opposing second end **364** may include a flange **366** configured to selectively engage the carrier **33***a*, **33***b* of a corresponding window balance assembly **32***a*, **32***b* of FIG. **1**.

The elongated body **358** may also include a first retaining member **372** having a resilient hinge portion **379** and a resiliently flexible leg **378** including a ramp surface **381**. The first retaining member **372** is configured to be biased or flexed into an unlocked position. In other words, the leg **378** may be biased or flexed and/or pivotable about the hinge portion **379** from a locked position (shown in FIG. **9**) downwardly such that a tip **380** of the leg **378** and/or the ramp surface **381** may be approximately co-planar with an upper surface **370** of the elongated body **358**. In some configurations, the elongated body **358** may include additional retaining members (not shown) that could be similar to either of the retaining members **72**, **372**, for example.

An anti-rotation feature **376** may be disposed between the flange **366** and the first retaining member **372**. Once the pivot bar **334** is attached to the lower sash **26**, the anti-rotation feature **376** may engage at least a portion of the lower sash **26** and brace the pivot bar **334** against torque or twisting forces applied on the pivot bar **334** and/or on the retaining member **372** as the lower sash **26** pivots about the pivot bars **334**. It should be understood, however, while the anti-rotation feature **376** resembles a collar or plate shape in FIG. **9**, other shapes and/or cross sections configured to engage at least a portion of the lower sash **26** may be used. For example, the anti-rotation feature **376** could be configured similarly to either of the anti-rotation features **76**, **276**.

At FIG. **10**, the pivot bar **334** is shown attached to the lower sash **26**. It should be understood that while other apertures are not shown in the lower horizontal portion **38** and the first vertical portion **40** (like in FIG. **2**A, for example), other apertures may be included in the lower horizontal portion **38** and the first vertical portions **40**.

To attach the pivot bar **334** to the lower sash **26**, the tapered end **362** of the elongated body **358** may be inserted into the aperture **50***a*. The aperture **50***a* may be sized to allow the elongated body **358** to snugly fit therethrough with the leg **378** in the unlocked position. The pivot bar **334** may be pushed horizontally through the aperture **50***a* into the channel **48**. As the pivot bar **334** is advanced into the aperture **50***a*, an interference between the ramp surface **381** and the aperture **50***a* forces the leg **378** to pivot downwardly about the hinge portion **379** until the ramp surface **381** and the tip **380** of the leg **378** become approximately co-planar with the upper surface **370** of the pivot bar **334** and can thereby pass through the aperture **50***a*. Once the pivot bar **334** is advanced to a point that the tip **380** passes through the aperture **50***a*, the leg **378** pivots upwardly about the hinge portion **379** in a "spring back" action. As such, the tip **380** of the leg **378** engages an inner surface **43** of the vertical portion **40** and the anti-rotation feature **376** engages at least an outer surface of the first vertical portion **40** as shown in FIG. **10**. Accordingly, the pivot bar **334** can be securely attached to the lower sash **26** without requiring any fasteners or mounting hardware. The same description may also apply to attaching the pivot bar **334** to the other side of the lower sash **26** and/or to attaching one or more pivot bars **334** to an upper sash of a double hung window assembly.

The foregoing description of the embodiments has been provided for purposes of illustration and description. It is not intended to be exhaustive or to limit the disclosure. Individual elements or features of a particular embodiment are generally not limited to that particular embodiment, but, where applicable, are interchangeable and can be used in a selected embodiment, even if not specifically shown or described. The same may also be varied in many ways. Such variations are not to be regarded as a departure from the disclosure, and all such modifications are intended to be included within the scope of the disclosure.

What is claimed is:

1. A pivot bar for a tiltable window sash comprising:

an elongated body having first and second opposing ends and upper and lower opposing surfaces extending between the first and second ends, the elongated body having a first longitudinal axis extending through the first and second ends about which the tiltable window sash is tiltable, the first end of the elongated body configured to be received in a carrier of a window balance assembly;

a retaining member extending upward from the upper surface of the elongated body that is resiliently flexible relative to the elongated body and comprises a first fixed end and a first free end; and

an anti-rotation feature comprising a projection extending outward from the elongated body substantially perpendicular to the first longitudinal axis;

wherein the first fixed end of the retaining member comprises a hinge portion connecting the retaining member to the elongated body;

wherein the first free end of the retaining member comprises a ramp surface inclined from the first fixed end outwardly from the upper surface of the elongated body and toward the first end;

wherein the ramp surface is pivotable about the hinge portion to a position such that the ramp surface is substantially coplanar with the upper surface of the elongated body;

wherein the anti-rotation feature is disposed intermediate the first end of the elongated body and the retaining member and engages an aperture in a vertical stile of the window sash to prevent rotation of the pivot bar;

wherein a distal tip of the first free end is configured to engage the vertical stile of the window sash; and

wherein the anti-rotation feature and the retaining member are configured to cooperably engage the tiltable window sash and securely attach the pivot bar thereto.

2. A pivot bar for a tiltable window sash comprising:

an elongated body having first and second opposing ends and upper and lower opposing surfaces extending between the first and second ends, the elongated body having a first longitudinal axis extending through the first and second ends about which the tiltable window sash is tiltable, the first end of the elongated body configured to be received in a carrier of a window balance assembly;

a first retaining member resiliently flexible relative to the elongated body and extending outward from the lower surface of the elongated body, the first retaining mem-

ber comprising a first leg extending from the lower surface of the body along a second longitudinal axis that is substantially perpendicular to the first longitudinal axis and a second leg extending from a first distal end of the first leg along a third longitudinal axis that is substantially parallel to the first longitudinal axis, the second leg having a first retaining prong protruding toward the lower surface of the elongated body; and

an anti-rotation feature comprising a fourth longitudinal axis that is perpendicular to the first longitudinal axis and substantially collinear with the second longitudinal axis and a projection extending from at least one of the upper surface and the lower surface of the elongated body in a first direction substantially perpendicular to the upper surface or the lower surface;

wherein the anti-rotation feature is configured to engage a first surface of the window sash in a second direction perpendicular to the first longitudinal axis and the first direction; and

wherein the anti-rotation feature and the first retaining member are configured to cooperably engage the tiltable window sash and securely attach the pivot bar to the tiltable window sash.

3. The pivot bar of claim **2**, further comprising a second retaining member extending from the lower surface of the elongated body and offset from the first retaining member along the first longitudinal axis; and

wherein the anti-rotation feature, the first retaining member, and the second retaining member are configured to cooperably engage the window sash and securely attach the pivot bar to the window sash.

4. The pivot bar of claim **3**, wherein the second retaining member is resiliently flexible relative to the elongated body;

wherein the second leg of the first retaining member has a second length along the third longitudinal axis;

wherein the second retaining member comprises a third leg along a fifth longitudinal axis and a fourth leg extending from a distal end of the third leg and having a fourth length along the third longitudinal axis and a second retaining prong protruding toward the lower surface of the elongated body;

wherein the fourth length is greater than the second length.

5. A tiltable window sash comprising the pivot bar of claim **4**.

6. A tiltable window sash comprising the pivot bar of claim **2**.

7. A tiltable window sash comprising:

a frame comprising an upper end and a lower end, a first vertical stile, a horizontal rail and a second vertical stile, the first and second vertical stiles connected to opposite ends of the horizontal rail at the lower end of the frame;

wherein the first vertical stile comprises a first aperture, the second vertical stile comprises a second aperture and the horizontal rail comprises a third aperture adjacent to the first aperture and a fourth aperture adjacent to the second aperture;

a first pivot bar attached to the frame at the first vertical stile and the horizontal rail and a second pivot bar attached to the frame at the second vertical stile and the horizontal rail, each pivot bar comprising:

an elongated body having first and second opposing ends and upper and lower opposing surfaces extending between the first and second ends, the elongated body having a first longitudinal axis extending through the first and second ends about which the tiltable window sash is tiltable, the first end of the elongated body configured to be received in a carrier of a window balance assembly;

a retaining member resiliently flexible relative to the elongated body and extending outward from the lower surface of the elongated body, the first retaining member comprising a first leg extending from the lower surface of the body along a second longitudinal axis that is substantially perpendicular to the first longitudinal axis and a second leg extending from a distal end of the first leg along a third longitudinal axis that is substantially parallel to the first longitudinal axis, the second leg having a retaining prong protruding toward the lower surface of the elongated body;

wherein the retaining prongs of the first and second pivot bars respectively engage the third and fourth apertures of the horizontal rail; and

an anti-rotation feature comprising a fourth longitudinal axis that is perpendicular to the first longitudinal axis and substantially collinear with the second longitudinal axis and a projection extending from at least one of the upper surface and the lower surface of the elongated body in a first direction substantially perpendicular to the upper surface or the lower surface;

wherein the anti-rotation feature of each of the first and second pivot bars is configured to engage the first and second vertical stiles, respectively, in a second direction perpendicular to the first longitudinal axis and the first direction; and

wherein the anti-rotation features and the retaining members are configured to cooperably engage the first and second vertical stiles to securely attach the pivot bars to the frame.

8. The tiltable window sash of claim **7**, wherein the first horizontal rail further comprises a fifth aperture and a sixth aperture located near the first vertical stile and a seventh aperture and an eighth aperture located near the second vertical stile;

wherein each of the first pivot bar and second pivot bar further comprises a second retaining member resiliently flexible relative to the elongated body and extending outward from the lower surface of the elongated body, the second retaining member comprising a third leg extending from the lower surface of the body along the second longitudinal axis and a fourth leg extending from a distal end of the third leg along a third longitudinal axis, the fourth leg having a second retaining prong protruding toward the lower surface of the elongated body;

wherein the third legs of the second retaining members of the first and second pivot bars respectively extend through the fifth and seventh apertures and the second retaining prongs respectively engage the sixth and eighth apertures.

9. A window assembly comprising the tiltable window sash of claim **8**.

10. The tiltable window sash of claim **8**, wherein a length of the second leg of the retaining member is less than a length of the fourth leg of the second retaining member.

11. A window assembly comprising the tiltable window sash of claim **7**.

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